REMARKS/ARGUMENTS

Favorable consideration of this application is respectfully requested. Applicant has amended claims 1-3, 6, 7, 13-19 and 25. Favorable reconsideration of this application is, consequently, earnestly solicited in view of the following remarks.

Claim Objections

Claims 1-3, 6, 7, 13-15, 18 and 19 were objected because of informalities. Claims 1-3, 6, 7, 13-15, 18 and 19 have been amended to overcome the objections.

Claim Rejections – 35 USC §103

Claims 1, 2, 4, 6-9, 13, 14, 16 and 18-21 were rejected under 35 USC §103(a) as being unpatentable over Ozawa et al. (U.S. Patent No. 2003/0160928) in view of Arakawa et al. (U.S. Patent No. 6,400,433).

In regard to claim 1, Examiner alleges that Ozawa discloses a flower-shaped vertical alignment structure liquid crystal display, and that, Arakawa teaches a circular polarizer and that it would have been obvious to combine the two disclosures to produce the liquid crystal display claimed in claim 1.

The subject application discloses a flower-shaped vertical alignment structure liquid crystal display for use in a transmissive mode display for large screen monitor and television applications. Ozawa discloses "a technique for obtaining a high-contrast display having a wide viewing angle in a transflective liquid crystal display that performs display in both a reflective mode and a transparent mode" (page 1, [0002]), which is "a

combination of a transflective liquid crystal display and a liquid crystal in a vertical alignment mode" (page 2, [0013]). Ozawa's technique can be used in the electric devices such as a cellular phone, a portable information processing unit and a wristwatch type device, applications having a very small size.

In the claims, Ozawa discloses, that typically "an insulating film is provided between at least one of the pair of substrates and the liquid crystal layer and in at least the reflective display area, the insulating film making the thickness of the liquid crystal layer in the reflective display area and in the transparent area different owing to its film thickness" as shown in Figure 5. (See page 5 [0066], page 6 [0077], and page 9, claims 1, 2 and 4).

Unlike Ozawa, in the subject application, the protrusion shaped pixel electrode is transparent in the transmissive mode, which can be made by the ITO layer itself or the protrusion shaped insulating films covered by the ITO layer. The protrusion shaped pixels are completely different, in both the working principle and the fabrication process, from the two different regions disclosed in Ozawa's disclosure.

In regard to the Arakawa reference cited by the Examiner, Arakawa teaches the preparation method for a circularly polarized plate which comprises a linearly polarizing membrane and a quarter wave plate. The preferred embodiment of the subject application uses circularly polarized light to get a higher transmittance. While the disclosed FVA mode is also workable with the crossed linear polarizers in principle, the resulting transmittance would be a limited transmittance.

Claim 1 has been amended to clarify that both the first and the second substrates have a circular polarizer on the exterior surface and the resulting circularly polarized light

is used as a light source so that the liquid crystal display operates in a transmissive mode. Combining the circular polarizer disclosed in Arakawa with liquid crystal display disclosed in Ozawa, does not overcome the deficiency in Ozawa as described above. Summarily, Ozawa discloses a transflective liquid crystal display with two regions that perform display in a reflective mode and a transparent mode. There is no motivation found for modifying Ozawa to add circular polarizer to the top substrate and the bottom substrate, and furthermore, the modification would not produce the tranmissive mode liquid crystal display disclosed in the subject application. Claim 1 has been further amended to clarify that the LCD is a transmissive mode display. For these reasons, Applicant believes that amended claim 1 is allowable under 35 USC 103 and thus, requests removal of the rejection.

In regard to claim 2, Examiner alleges that Ozawa discloses a second substrate having an empty hole. Inclusion of a hole in the substrate does not overcome the deficiencies provided above in regard to claim 1. As described in regard to claim 1, the subject application discloses a liquid crystal display having completely different working principle. In the subject application, it is preferable to get a flower blossom configuration under the electric field because the holes on the common electrode are right above the protrusion shaped pixel electrode, wherein either a positive or negative dielectric liquid crystal material can be used for operation in a transmissive mode.

The configuration disclosed in Ozawa is limited to only using negative dielectric liquid crystal materials to meet the working principle of the transflective mode. For these reasons, in combination with the reasons provided in regard to claim 1, Applicant

believes that dependent claim 2, is allowable user 35 USC 103. Thus, removal of the rejection is respectfully requested.

Examiner rejected claims 6, 7, 8 and 9 citing the Ozawa reference. For the reasons provided above in regard to claims 1 and 2, Applicant believes that dependent claims 6, 7, 8 and 9 are allowable over the cited references and requests removal of the rejection.

In regard to claims 13, 14, 16 and 18-21, application of a voltage to the LCD to generate an electric field is insufficient to overcome the deficiencies provided above in regard to claims 1-2 and 6-9. Claim 13 has been amended to clarify that that a first aligning layer is formed on the first substrate for aligning the liquid crystal layer and that a second aligning layer is formed on the second substrate to form a circular polarizer in the liquid crystal display. Claim 13 has been further amended to clarify that the liquid crystal display has a wide view angle, fast response and high contrast ratio in a transmissive mode. Ozawa does function in a transmissive mode. For this reason, and the reasons provided above, Applicant believes that dependent claims 14, 16 and 18-21 are allowable under 35 USC 103 over the cited references. Removal of the rejection is respectfully requested.

Claims 3 and 15 were rejected under 35 USC 103(a) as being unpatentable over Ozawa in view of Arakawa and further in view of Shimoshikiryo alleging that Ozawa, as modified by Arakawa, discloses all of the limitation of the subject claims except for the hexagon-shaped hole.

As noted by the examiner, Shimoshikiryo mentions that the shape of the opening can be changed from a square to a circle or a polygon due to their ability to be closely arranged on an electrode and their ability to produce a more axially symmetric

orientation. In Shimishikiryo's disclosure, one of the main aims is to obtain a sufficient orientation-regulating force by modifying the structure of one of a pair of electrodes for applying a voltage across a liquid crystal layer. Shimoshikiryo discloses and claims, in claim 1, a liquid crystal display device comprising "the first electrode includes a lower conductive layer, a dielectric layer covering the lower conductive layer, and an upper conductive layer provided on one side of the dielectric layer which is closer to the liquid crystal layer; the upper conductive layer includes an upper layer opening for each of the plurality of picture element regions, and the lower conductive layer includes a lower layer opening for each of the plurality of picture element regions", and "each of the upper layer opening and the lower layer opening has a side extending in a direction perpendicular to the predetermined direction, and a boundary between the first region and the second region and a boundary between the second region and the third region extend in parallel to the side". Thus, it is possible to provide a vertical alignment type liquid crystal display device which has a sufficiently stable orientation even though there are openings (holes) on one side of the substrates.

It is easy to have a sufficiently stable liquid crystal orientation with a symmetric polygon opening when the electric field is applied. The subject application discloses a hexagon-shaped hole as the opening due to its easy preparation from the manufacture point. Therefore, it is not obvious to one of ordinary skill in the art at the time the invention was made to have formed the hole disclosed by Arakawa to have a hexagon shape in further view of Shimoshikiryo's disclosure since the invention motivations are completely different.

The mere fact that someone in the art can rearrange parts of a reference device to meet the terms of a claim is not by itself sufficient to support a finding of obviousness. The prior art must provide a motivation or reason for someone of ordinary skill in the art, without the benefit of the inventor's specification to make the necessary changes in the reference device. For these reasons applicant believes that claim 3 and 15 are allowable over the added Shimoshikiryo reference and thus, respectfully requests removal of the rejection.

Claims 5 and 17, claims 10 and 22, claims 11 and 23, and claims 12 and 24 were rejected under 35 USC 103(a) as being unpatentable over Ozawa in view of Arakawa and further in view of Lu, Ikedia, Matsuyama, and Yoshida, respectively, alleging that Ozawa, as modified by Arakawa, discloses all of the limitation of the subject claims except for the hexagon-shaped hole, wall-bump protusions on the ITO layer, positive dielectric anisotropy and a negative dielectric anisotropy, respectively.

In regard to claims 5 and 17, as the examiner noted, Lu discloses an inorganic aligning layer as advantageous due to its stable chemical properties in enduring exposure to various types of illumination. As is well known in the art, the rubbing process is usually required for the polymer films as the liquid crystal alignment layers. This rubbing process may destroy our protrusion shape pixel electrodes and even pollute the device. The inorganic layer needs no further rubbing process in the liquid crystal device disclosed in the subject application. It is the main reason that the inorganic material was selected as the vertical alignment layer.

In regard to claims 10 and 22, Ikeda uses bump protrusions and slits that are interchangeable to establish liquid crystal partitions, where the projection patterns (bump

protrusions) and the slits are formed in a zig-zag fashion, which usually results in a four-domain liquid crystal orientations. The purpose of the wall-bump protrusions in the subject application is to help the formation of axially symmetric FVA distribution.

In regard to claims 11 and 23, Matsuyama discloses a liquid crystal display that the liquid crystal composition has positive dielectric anisotropy and is oriented vertically to the facing surfaces of the substrates in the switch-off state, where no openings or protrusions are specially included.

The contrast ratio is the value of the light transmittance in the switch-on state divided by the light leakage in the switch-off state. For a vertically-aligned liquid crystal display, the light leakage in the switch-off state is very low and nearly the same regardless of whether the liquid crystal material is a positive dielectric anisotropy or a negative dielectric one under the same device configuration. The vertically-aligned liquid crystal display with the negative dielectric anisotropy is easily to bend in getting a maximum light transmittance under the longitudinal electric field, while it is not the case for a vertically-aligned liquid crystal display with the positive dielectric anisotropy. Therefore, it is hard to say that the advantages of a vertically-aligned liquid crystal display with the positive dielectric anisotropy is that it can attain higher contrast levels than a liquid crystal with the negative dielectric one.

In regard to claims 12 and 24, Yoshida disclosures a technology for alignment-treating the alignment layers of a liquid crystal display, specifically the alignment treatment upon the irradiation with the ultraviolet rays. In column 13 lines 9-15, Yoshida discloses the pretilt angle definition for different types of liquid crystals, where the liquid crystal having a negative dielectric anisotropy is preferred with the vertical alignment

layer, and the liquid crystal having a positive is preferred with the horizontal alignment layers. It is common for the conventional vertical alignment mode and some other ECB modes.

The subject application discloses that a liquid crystal with the positive dielectric anisotropy is preferred since it has a faster response time as we discussed in the disclosure, page 9, lines 4-11.

In regard to claims 25 and 26 were rejecting as being unpatentable over Ozawa in view of Arakawa and further in view of Koma.

Koma's patent shows a field exhibited by the orientation of liquid crystal directors and symmetry of the electrode layout as plotted in Figures 6 and 7 to provide a uniform viewing angle characteristics at all viewing angle directions, wherein "at least one of the plurality of pixels has an opening formed" (claim 1) and "the opposed electrode is formed almost all over a surface of the second substrate as a single electrode" (claim 4).

The subject application discloses openings on one of the substrates, and protrusion shaped electrodes on the other substrate as the pixel electrodes instead of a flat one. The pixel electrodes can act more than as a single electrode on the whole. The subject application discloses a configuration that not only provides a symmetric liquid crystal directors distribution under the electric field for better viewing angles, but also has a fast response time.

There is no teaching, nor suggestion for modifying Okawa to include the features of Arakawa or to further modify Ozawa to include the features of Shimoshikiryo, Lu, Ikedia, Matusuyama, Yoshida or Koma to produce a display device including all the novel features of the amended claims. Under well recognized rules of the MPEP (for

example, section 706.02(j)), the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure.

Applicant contends the references cannot be modified to incorporate the features of subject claims 1-26 without utilizing Applicant's disclosure. The courts have consistently held that obviousness cannot be established by combining the teachings of the prior art to Applicant to produce the claimed invention, absent some teaching, suggestion, incentive or motivation supporting the combination.

For the reasons provided above, and the reasons provided in regard to claims 1 and 13, applicant believes that claims 5 and 17, claims 10 and 22, claims 11 and 23 and claims 25 and 26 are allowable under 35 USC 103. Thus removal of the rejection is respectfully requested.

In view of the foregoing considerations, it is respectfully urged that claims 1-26 be allowed. Such action is respectfully requested. If the Examiner believes that an interview would be helpful, the Examiner is requested to contact the attorney at the below listed number.

Respectfully Submitted;

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